Alessandro Laneve

Curriculum Vitae

Working experience

November 2022-Present **Post-doc Researcher**, *Nanophotonics Group, University of Rome "La Sapienza"*, Rome, Italy, *Project*: EU project "Quantum Dots for Entanglement-based Quantum Key Distribution (QD-E-QKD)", https://www.qd-e-qkd.eu/.
Principal investigator: Rinaldo Trotta
Description of the project: Entanglement is a fundamental ingredient for extending quantum key distribution from two-party communication to networks without trusted nodes. Yet, the commercial application of this concept is currently hindered by the probabilistic nature of the photon-generation process underlying the used entanglement resources. QD-E-QKD will develop a novel technology based on semiconductor quantum dots and test it in realistic urban communication scenarios to surpass the limits of current approaches to entanglement-based quantum key distribution.

Education

October-December 2021 **Visiting PhD student**, *Queen's University of Belfast*, Belfast, United Kingdom.
Local Supervisor: Mauro Paternostro
Aim of the collaboration: ideation and development of a general multipartite entanglement distribution protocol, through the employment of separable entanglement carriers.

November 2019–2022 **PhD in Physics**, *University of Rome "La Sapienza"*, Rome, Italy.
Project Title: Diverse Applications of the Quantum Walk model in Quantum Information: a theoretical and experimental analysis in the optical framework
Thesis Supervisor: Paolo Mataloni
Field of research: Quantum Optics, Quantum Information
Research topic: The thesis project focuses on the exploitation of the Quantum Walk model to theoretically and experimentally analyze the behavior of useful resources propagating in a network, in different frameworks.

2017–2019 **Master degree in Theoretical Physics**, *University of Rome "La Sapienza"*, Rome, Italy, *110/110 cum laude*.
Title: Theoretical and experimental analysis of super-diffusive processes by Quantum Walks
Supervisor: Paolo Mataloni
Description: The thesis topic relies on the properties of Quantum Walks (QW) using a bulk-optics experimental apparatus that allows to implement various disorder patterns through a set of tunable phases. Through that, it is possible to scan the region between the diffusive and ballistic behaviour of a QW by only imposing phase shifts, thus preserving the coherence features of the system.

2014–2017 **Bachelor degree in Physics**, *University of Rome "La Sapienza"*, Rome,Italy, *110/110 cum laude*.
Title: Principio di Landauer e Informazione Quantistica
Supervisor: Fabio Sciarrino
Description: The thesis focused on the thermodynamical foundation of classical and quantum information theory, through the definition of both and the analysis of their properties by the point of view of Landauer's principle.

2009–2014 **Secondary School Diploma in Classics / Classical Studies**, *Liceo Classico Statale Torquato Tasso*, Rome, Italy, *100/100*.

Summer Schools

June 2021 **11th Optoelectronics and Photonics Summer School NMP2021 NEUROMORPHIC PHOTONICS**, *Organized by University of Trento and the Institute for Cross-Disciplinary Physics and Complex Systems (IFISC) of the University of the Balearic Islands*, Monte Bondone -Trento, Italy.
Description: the school aimed at introducing students and post-docs with an optics background to the concepts of neuromorphic photonics, focusing on the hot topics that are driving the technological and scientific research in this field.

Other courses

September 2021 **Corso di Alta Formazione: La comunicazione della scienza (Science communication)**, *Organized by Department of Biology and Biotechnology of Sapienza University of Rome*, Rome, Italy.
Description: the course consisted of two parts: the first providing a general class about public speaking in english, while the second focused on the communication of scientific concepts to the wide public.

Teaching

March-June 2022 **Tutor for the course of "Fisica Generale per Scienze Geologiche"**, *Dipartimento di Scienze della Terra*, Sapienza, University of Rome.
Tutoring activity for the General Physics course taught to Geological Sciences bachelor students, in assistance to Prof. Michele Ortolani and Prof. Ettore Majorana.

Research grants awarded

November 2023 **Funding for "Progetto di ricerca medio" with the role of "research group component"**, *Awarded by University of Rome "La Sapienza"*.
Project Title: On-demand polarization qubits from a symmetric optical microcavity
Principal investigator: Francesco Basso Basset

November 2022 **Funding for "Progetto di Avvio alla Ricerca - Tipo 2"**, *Awarded by University of Rome "La Sapienza"*.
Project Title: Harnessing high-dimensional photonic systems for enhanced experimental Quantum State Discrimination with solid state single photon sources
Tutor: Rinaldo Trotta

October 2021 **Funding for "Progetto di Avvio alla Ricerca - Tipo 1"**, *Awarded by University of Rome "La Sapienza"*.
Project Title: Experimental quest for Quantum State Discrimination strategies based on Quantum Networks and Machine Learning methods
Tutor: Paolo Mataloni

Publications

2022 **A scheme for multipartite entanglement distribution via separable carriers**, Laneve A., McAleese H., and Paternostro M., New Journal of Physics **24** (12), 123003

2022 **Experimental multi-state quantum discrimination through optical networks**, Laneve A., Geraldi A., Hamiti F., Mataloni P., and Caruso F., Quantum Science and Technology **7** (2), 025028

2021 **Enhancing nonclassical bosonic correlations in a quantum walk network through experimental control of disorder**, Laneve A.,Nosrati F., Geraldi A., Shadfar M. K., Pegoraro F., Mahdavipour K., Lo Franco R., and Mataloni P., Phys. Rev. Research **3**, 033235

2021 **Readout of quantum information spreading using a disordered quantum walk**, Nosrati F., Laneve A., Shadfar M. K., Geraldi A., Mahdavipour K., Pegoraro F., Mataloni P., and Lo Franco R., JOSA B, **38**(9), 2570-2578

2021 **Transient subdiffusion via disordered quantum walks**, Geraldi A., De S. Laneve A., Barkhofen S., Sperling J., Mataloni P., and Silberhorn C., Physical Review Research **3** (2), 023052

2019 **Experimental investigation of superdiffusion via coherent disordered Quantum Walks**, Geraldi A., Laneve A., Bonavena L. D., Sansoni L., Ferraz J., Fratalocchi A., Sciarrino F., Cuevas A., and Mataloni P., Physical Review Letters **123**,140501

Preprints

2022 **Experimental Multi-state Quantum Discrimination in the Frequency Domain with Quantum Dot Light**, Laneve A., Rota M.B., Basso Basset F. Fiorente N. P., Krieger T.M., Covre da Silva S.F., Buchinger Q., Stroj S., Hoefling S., Huber-Loyola T., Rastelli A., Trotta R., and Mataloni P., arxiv preprint arXiv:2209.08324

Scientific Oral Communications

July 2024 **Wavevector-polarization correlation in entangled photons from radiative cascades**, *Central European Workshop on Quantum Optics CEWQO 2024, Olomouc, Czech Republic*

May 2024 **Polarization-wavevector correlation in entangled photons from cavity-embedded quantum dots**,*Quantum Matter International Conference - QUANTUMatter 2024 (San Sebastian, Spain)*

Nov 2021 **Experimental Enhancement of non-classicality in bosonic correlations through a disordered Quantum Walk**, *Quantum Information and Measurements VI, organized by OPTICA (Virtual presentation)*

Nov 2020 **Experimental analysis of superdiffusive transition dynamics in a disordered photonic Quantum Walk**, *Quantum Technology International Conference - QTech 2020 in Barcelona, Spain (Virtual presentation)*

Sep 2020 **Manipulating non-classical correlations via inhomogeneous Quantum Walks**, *24th IMEKO TC4 International Symposium 22nd International Workshop on ADC and DAC Modelling and Testing (IMEKO TC-4 2020) in Palermo, Italy (Virtual Presentation)*

Scientific Poster Presentations

July 2023 **Experimental strategies for the identification of high-dimensional single photon states produced by Quantum Dots**, *Central European Workshop on Quantum Optics CEWQO 2023, Milan, Italy*

Dec 2022 **Harnessing Quantum Dot light for quantum discrimination of high-dimensional single photon states**, *8th International Workshop on "Engineering of Quantum Emitters Properties (EQEP)", Stuttgart, Germany*

Sep 2022 **Multipartite entanglement distribution via separable systems (Flash Talk)**, *SFB-BeyondC Conference 2022 "Frontiers of Quantum Information Science", Wien, Austria*

July 2022 **Quantum state discrimination through experimental time- binning dynamics**, *15th International Conference on Quantum Communication, Measurement and Computing (QCMC), Lisbon, Portugal*

Jun 2022 **Quantum multi-state discrimination through time-multiplexing photonic networks**, *5th Seefeld Workshop on Quantum Information, Seefeld, Tyrol, Austria*

Jun 2021 **Quantum state discrimination via Quantum Network: a bulk-optics approach (Flash Talk)**, *11th Optoelectronics and Photonics Summer School NMP2021 NEUROMORPHIC PHOTONICS in Monte Bondone -Trento, Italy (Virtual presentation)*

Outreach activities

May 2024 **QuanTour initiative** *Media content creation and outreach activities in the context of "QuanTour", an official outreach project of the DPG for the International Year of Quantum Science and Technology 2025*

April 2024 **Italian Quantum Weeks**, *Guide to the exhibition "Dire l'indicibile: viaggio nella meccanica quantistica", organized by Italian Quantum Weeks and Sapienza.*

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